

providing a phase forming vessel, and  
 subjecting said biomass, contained within said hydrolysis vessel, to hydrolysis by said aqueous acidic solution to form a hydrolysate containing sugars, and  
 withdrawing said hydrolysate from said hydrolysis vessel, and  
 transferring said hydrolysate to said phase forming vessel to form two phases; a sugar phase and an aqueous acidic solution phase, and  
 separating said sugar phase from said phase forming vessel, and  
 separating said aqueous acidic solution phase, from said phase forming vessel, for subsequent recycle to said hydrolysis vessel, and  
 withdrawing residue, remaining from hydrolysis of said biomass, containing lignins, from the hydrolysis vessel, thereby hydrolysis of a biomass forms a hydrolysate containing sugars and substantially separating the sugars from the hydrolysate and withdrawing residue remaining from hydrolysis of the biomass from the hydrolysis vessel and the hydrolysate, with sugars substantially removed, will provide recycled aqueous acidic solution to the hydrolysis vessel.”

Accordingly the intent of the invention is clearly stated.

3. Pertaining to a claims 4, 5, 10, 12 and 17 rejected under 35 U.S.C. 112. Claims 10 12 and 17 are dependent on a dependent claim which is dependent on independent claim 1 These claims refer to, and are dependent on claim 1. Thus requirements of 35 U.S.C. 112, appropriate paragraphs, have been fulfilled.

Regarding claims 4 and 5, these claims are appropriately amended to meet requirements for Markich groups.

4. (amended) The method of claim 1 wherein said biomass is selected from the group [which include] consisting of wood, paper and lignocellulose materials including an individual or a combination of these thereof.

5. (amended) The method of claim 1 wherein said sugars consist of the group [which include] consisting of glucose and pentose sugars including an individual or a combination thereof.

Regarding claims 10, 12, 16 and 17, all lacking antecedent basis and subsequently rejected. The terms “filtered residue”, “aqueous solution” and “extractate” are provided by amended claims to establish an antecedent basis, as follows;

10. (amended) The method of claim ]8] 9 wherein [said] the filtered residue is subjected to extraction by water to produce water extracted residue and an aqueous extractate.

11. (amended) The method of claim 1 wherein said sugars [is] are dissolved by an aqueous solution.

12. (amended) The method of claim [10] 11 wherein [said] the aqueous solution is supplied from a fermentation broth.

13. (amended) The method of claim [10] 11 wherein [said] the aqueous solution [containing] contains an acid and is neutralized by a base or calcium carbonate.

14. (amended) The method of claim [10] 11 wherein [said] the aqueous solution [containing] contains an acid and is neutralized by ammonia.

[16. The method of claim 14 wherein said filtered residue is subjected to extraction with water to form extracted residue and an extractate.]

The topic of claim 16 was sufficiently covered within claim 10 and therefore claim 16 is deleted.

17. (amended) The method of claim [15] 10 wherein the aqueous extractate [containing] contains an acid and is neutralized by a base.

Accordingly an antecedent basis for these amended claims has been established, and claim 17 becomes claim 16.

4. Pertaining to a quotation of the appropriate paragraphs of 35 U.S.C. 102. The current patent application is devoid of any information obtained from all publications, both domestic and foreign, or public use or sale less than one year prior to the date of this application. Thus requirements of 35 U.S.C. 102, appropriate paragraphs, have been fulfilled.

5. Pertaining to a claims 1-12, 15 and 17-19 rejected under 35 U.S.C. 102(b) as being anticipated by Clausen, et al.

The art of Clausen, et al., teaches a well known acid hydrolysis procedure, which discloses acid recovery or neutralization from a solution containing acid and sugars to furnish a solution of sugars, subject to fermentation. Whereas the applicant discloses a method substantially different from these teachings. For example, quoting claim 1, "transferring said hydrolysate to said phase forming vessel to form two phases; a sugar phase and an aqueous acidic solution phase, and separating said sugar phase from said phase forming vessel, and separating said aqueous acidic solution phase, from said phase forming vessel, for subsequent recycle to said hydrolysis vessel," Therefore, sugars are incompletely removed from the resulting hydrolysate and form a hydrolysate, containing sugars, for recycle for subsequent hydrolysis. In conclusion, the teachings of Clausen et al. are irrelevant to claim 1 within the present invention, and are without application to claims 1-12, 15, 17 and 17-19 which are ultimately dependent on claim 1.

6. Concerning the quotation within 35 U.S.C. 103 (a), and obviousness basis.

This declaration is lacking application to the present invention, claim 1, as presented previously.

The fact that the present invention is both novel and unobvious to one skilled in the art has been accordingly established.

7. Relative to, *Graham v. John Deere Co.*, 383 U.S., 1,148 USPQ 459 1966). Upon reviewing the inquiry of *Graham v. John Deere Co.*, it was concluded that these particulars are inapplicable to the present invention. Accordingly the fact, that background for determining obviousness or unobviousness is lacking application, has been established.

8. Concerning rejections of claims 13, 14 and 16 under 35 U.S.C. 103 (a), as being unpatentable over Clausen, et al.(U.S. Patent No. 5,188,673) in view of Brink, (U.S. Patent No. 5,366,558).

Claims 13, 14 and 16 are dependent on dependent claims which are basically dependent on independent claim 1. The teachings of Clausen, et al. and Brink are lacking application to the present invention, claim 1, because these teachings lack reference to required formation of two phases; a sugar phase and an aqueous acidic solution phase, as specified within claim 1. Claim 16 has been deleted previously, so that claim 16 may be regarded as an immaterial issue.

In acknowledgment of *In re Raner*, 134 U.S.P.Q. 343 (CCPA 1962), as presented by the examiner, the following remarks are made. Within a search of 134 U.S.P.Q. 343 (CCPA 1962), *In re Rainer* was found, rather than the spelling of *In re Raner*, so the correct spelling is assumed to be *In re Rainer*. With this finding, relationship to the present case was found devoid of significant meaning.

Regarding prior art teachings of Clausen, et al., and Brink, the prior art search found these references as related to the present invention and were found lacking application to the present invention, claim 1. As previously stated, these references are well known. In conclusion, the teachings of Clausen, et al., and Brink are inapplicable to the present invention. Furthermore, motivation to combine these teachings was deemed unsuited. Notice that within the present invention claim 1, transfer of hydrolysate to a phase forming vessel to form two phases; a sugar phase and an aqueous acidic solution phase, is devoid within the prior art.

Concerning this communication from the examiner, an inquiry is unforeseen at this time.

What is claimed is:

1. A method for separating sugars from a biomass hydrolyzed by an aqueous acidic solution which comprises:

providing a hydrolysis vessel for hydrolysis of a biomass, and

providing a supply of said biomass to said hydrolysis vessel, and

providing a supply of said aqueous acidic solution to said hydrolysis vessel, and

providing a phase forming vessel, and

subjecting said biomass, contained within said hydrolysis vessel, to hydrolysis by said aqueous acidic solution to form a hydrolysate containing sugars, and

withdrawing said hydrolysate from said hydrolysis vessel, and

transferring said hydrolysate to said phase forming vessel to form two phases; a sugar phase and an aqueous acidic solution phase, and

separating said sugar phase from said phase forming vessel, and

separating said aqueous acidic solution phase, from said phase forming vessel, for subsequent recycle to said hydrolysis vessel, and

withdrawing residue, remaining from hydrolysis of said biomass, containing lignins, from the hydrolysis vessel, thereby hydrolysis of a biomass forms a hydrolysate containing sugars and substantially separating the sugars from the hydrolysate and withdrawing residue remaining from hydrolysis of the biomass from the hydrolysis vessel and the hydrolysate, with sugars substantially removed, will provide recycled aqueous acidic solution to the hydrolysis vessel.

2. The method of claim 1 wherein said hydrolysis vessel is established at a predetermined temperature of about 30°C. to about 45°C. and maintained at substantially isothermal conditions.

3. The method of claim 1 wherein said phase forming vessel is established at a predetermined temperature of about 0°C. and maintained at substantially isothermal conditions.

4. The method of claim 1 wherein said biomass is selected from the group consisting of wood, paper and lignocellulose materials including an individual or a combination thereof.

5. The method of claim 1 wherein said sugars consist of the group consisting of glucose and pentose sugars including an individual or a combination thereof.

6. The method of claim 1 wherein said sugars are subjected to fermentation to produce ethanol.

7. The method of claim 1 wherein said hydrolysate, withdrawn from said hydrolysis vessel, is subjected to a temperature of about 0°C.

A<sub>2</sub>

8. The method of claim 1 wherein said hydrolysate is subjected to cooling, to produce a phase of sugars and a phase of said aqueous acidic solution.

9. The method of claim 1 wherein said residue, containing lignins, is filtered to produce filtered residue and a filtrate for recycle to the hydrolysis vessel.

10. The method of claim 9 wherein the filtered residue is subjected to extraction by water to produce water extracted residue and an aqueous extractate.

11. The method of claim 1 wherein said sugars are dissolved by an aqueous solution.

12. The method of claim 11 wherein the aqueous solution is supplied from a fermentation broth.

13. The method of claim 11 wherein the aqueous solution contains an acid and is neutralized by a base or calcium carbonate.

14. The method of claim 11 wherein the aqueous solution contains an acid and is neutralized by ammonia.

15. The method of claim 1 wherein said residue is subjected to filtering to produce filtered residue and a filtrate for recycle to said hydrolysis vessel.

16. The method of claim 10 wherein the aqueous extractate containing an acid is neutralized by a base.

17. The method of claim 1 wherein said aqueous acidic solution contains sugars.

18. The method of claim 1 wherein said aqueous acidic solution contains about 70% sulfuric acid.

A<sub>3</sub>

A<sub>4</sub>

Rule

126

(original claim numbers)